Moderating effect of IBS acceptance on psychosocial mediators of Irritable Bowel Syndrome

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Abstract *Background/Objective:* In this study a theoretically driven model is presented of how gastrointestinal anxiety, behavioural response, symptom severity, quality of life and IBS acceptance interact to determine how people cope and respond in IBS. *Method:* Cross-sectional data from 166 outpatients attending a motility disorders clinic was used to test a model of moderated serial mediation. *Results:* Gastrointestinal anxiety and behavioural response were found to serially mediate the relationship between symptom severity and quality of life; each step of this 'indirect effect' was significant at the $p<.001$ level. The strength of the mediatory effect was linearly related to IBS acceptance; a significant interaction was found between IBS acceptance as a moderator at the level of the indirect effect (-.0091, *95%CI* = -.0163 to .0019). *Conclusions:* Findings suggest that the effect of multiple psychosocial variables in IBS experience and outcomes may be conditional on levels of IBS Acceptance. The theoretical and clinical implications of these findings are discussed.

Key Words: Irritable Bowel Syndrome (IBS), IBS Acceptance , Moderated Serial Mediation, Descriptive Survey Study, IBS Acceptance

Introduction

Irritable Bowel Syndrome (IBS) is a functional bowel disorder (i.e. with no known physiological cause unlike Inflammatory Bowel Disease (IBD)) in which recurrent abdominal pain is associated with symptoms such as diarrhoea, constipation, urgency of defecation, bloating, or sensation of incomplete evacuation. Depending on stool patterns, IBS can be further specified as being diarrhoea predominant (IBS-D), constipation predominant (IBS-C), mixed or alternating type (IBS-M), or unspecified (IBS-U) (Lacy et al., 2016). IBS affects between 7.0-8.3% of the population of Europe (Sperber et al., 2017). Studies consistently find that those living with IBS experience a significantly reduced quality of life (Lacy et al., 2016). Yet despite the conditions' prevalence, well-documented clinical profile and associated economic burden (Drossman, 2016; Soubieres, Wilson, Poullis, Wilkins, & Rance, 2015) the mechanisms through which people cope and respond in IBS remain poorly understood. Drossman's (2016) biopsychosocial model of IBS posits that early life/premorbid genetic and environmental factors (e.g. parenting, infection) might play a role in the development of both psychosocial (susceptibility to stress, psychological illness, psychological traits) and physiological (abnormal motility, visceral hypersensitivity) factors leading to the expression of IBS symptoms through an interplay between psychosocial and physiological factors via the interactions between Central Nervous System (CNS) and the Enteric Nervous System (ENS).

Quality of Life

Greater pain and discomfort are associated with poorer outcomes compared to more mild symptoms and symptom severity appears to be a strong predictor of the quality of life outcomes in IBS (De Gucht, 2015). Many with IBS report a loss of social or professional confidence relating to feelings of shame and embarrassment of their condition. Avoidance of

intimacy, travel and leisure is also common, driven by fear of exacerbating symptoms (Schneider & Fletcher, 2008) as is a decrease in appetite and difficulty sleeping (Farzaneh, Bijan, Mehdi, Nosratollah, & Farbod, 2015; Kalani, Naliboff, Shih, Mayer, & Chang, 2017). Psychological distress is common amongst the IBS population and over 50% have a comorbid psychiatric diagnosis; depression, anxiety and somatisation being most frequently diagnosed (Creed et al., 2013). Evidence suggests that there is variance between IBS subtype (according to Rome III criteria: diarrhoea, constipation, mixed, or unspecified) and disease-related quality of life, with poorer outcomes in domains of food avoidance, relationships and daily activity impact for IBS-diarrhoea and IBS-mixed subtypes (Singh et al., 2015). Several psychosocial variables have been linked with poor outcomes, shaping how people cope and respond to symptoms in IBS (Van Oudenhove et al., 2016).

Gastrointestinal Anxiety

Gastrointestinal anxiety is a typical characteristic of IBS experience and can be defined as "the cognitive, affective and behavioural response stemming from fear of gastrointestinal sensations and symptoms and the context in which [they] occur" (Labus, Mayer, Chang, Bolus, & Naliboff, 2007). Strongly associated with psychological well-being, overall quality of life and symptom severity and illness perception (Knowles et al., 2017), gastrointestinal anxiety has been hypothesised and demonstrated as a key mediator of the relation between IBS symptom severity and quality of life (Wolitzky-Taylor, Craske, Labus, Mayer, & Naliboff, 2012).

Behavioural Response

Impact on quality of life could also been, at least in part, to stereotyped maladaptive behavioural patterns commonly observed in IBS (Reme, Kennedy, Jones, Darnley, &

Chalder, 2010). Often these patterns are related to specific abnormal illness behaviours such as somatization and excessive consultation (Van Oudenhove et al., 2016). By far the most common behavioural strategy employed in IBS is avoidance; to cope with visceral sensations which prompt unpleasant cognitions and emotions, situations which may provoke these negative experiences are typically avoided (Drossman et al., 2009). Such scenarios include social interaction, certain foods or meal times, leisure activities where a bathroom may not be accessible, exercise, sex or the workplace. As a behavioural strategy, the tactic of 'limiting exposure' is associated with a poorer quality of life. Rutter & Rutter (2002)have shown variants of avoidant behaviour such as behavioural disengagement and restraint coping, mediate poor psychological outcomes including anxiety and depression. Their work highlights the close association of belief and expectations about the IBS (illness representation) and maladaptive avoidant behaviours. Indeed, these behaviours show persistence even in the absence of symptoms, suggesting a potentially stronger relation between illness representation and negative, stereotyped behavioural outcome than possibly expected (Corney & Stanton, 1990).

IBS Acceptance

Acceptance as a core construct of the Acceptance and Commitment Therapy framework (ACT; Hayes, Strosahl, & Wilson, 1999) can be defined as "a willing contact with negative private experiences (physical or psychological) in the service of living a more valued life" (ACT; Hayes, Strosahl, & Wilson, 1999). Ferreira et al. (2014) provide a useful conceptualization of the IBS experience from an ACT framework: "A proportion of IBS patients can be functionally characterized by the use of behaviours that seek to control, eliminate or alter the physical, emotional and cognitive experiences associated with IBS both in the presence or absence of symptoms. These behaviours seem to be motivated by an

excessive fusion with a self-conceptualization of being an IBS patient; fusion with unhelpful illness specific beliefs or cognitions; and by a dominance of feared future consequences or comparison with an idealized past. IBS patients also tend to choose to engage in these avoidant behaviours that provide short-term relief from their experiences over engaging in behaviours that are values-consistent and that might lead to better life satisfaction on the long-term."(p.33). Therefore, IBS acceptance could be seen as a form of willingness to come into contact with unpleasant experiences of physical symptoms and with the feelings of embarrassment, anticipatory anxiety and distressing thoughts commonly associated with IBS; whilst at the same time pursuing valued life activities regardless of the presence of IBS (Ferreira et al., 2014; Ferreira, Eugenicos, Morris, & Gillanders, 2013). Recent evidence from Ferreira, Gillanders, Morris, & Eugenicos (2018) found that as a process of change, increase in IBS acceptance is associated with improved quality of life outcomes, reduced avoidant behaviours and reduced gastrointestinal anxiety. A subsequent component study using self-help resources aimed to IBS acceptance replicated some of these outcomes, specifically reductions in gastrointestinal anxiety and symptom severity (Gillanders, Ferreira, Angioni, Carvalho, & Eugenicos, 2017).

Rationale

Multiple psychosocial variables are implicated in the relationship between symptom severity and quality of life in IBS. The aim of this study is to present and test a theoretically-driven model which reconciles symptom severity, gastrointestinal anxiety, behavioural response, quality of life and IBS acceptance to explain how people cope and respond in IBS. Our two hypotheses below are summarised in a model of moderated serial mediation (Figure 1).

Hypothesis 1: The relationship between symptom severity on quality of life in IBS is serially mediated by gastrointestinal anxiety and subsequent behavioural response.

Hypothesis 2: Levels of IBS acceptance moderate the mechanism through which gastrointestinal anxiety and behavioural response serially mediate the effect of symptom severity on quality of life.

INSERT FIGURE 1 AROUND HERE

Methods

Participants

The study drew on secondary, cross-sectional data combined from participants recruited to take part in two ACT-based intervention studies conducted at the University of Edinburgh (Ferreira et al., 2018, *N*=121; Gillanders et al., 2017, N=45). Both studies recruited gastroenterology outpatients from a motility disorders clinic in Edinburgh, UK. Gastroenterology consultants confirmed all participants were on the IBS 'refractory' spectrum (having experienced no symptom improvement under primary care treatment for the past 12 months) using the Rome III criteria (classifying IBS-type as *diarrhoea, constipated* or *mixed)* (Lacy et al., 2016) and clinical interview. Participants were required to be fluent in English and over 18 years old. Pregnant, breast feeding or any participant with a cognitive impairment or symptoms of inflammatory or neoplastic disorder were excluded from the study.

Data Sample

The study utilised single time-point data collected *before* intervention including self-report measures of symptom severity, quality of life, gastrointestinal anxiety, behavioural response

and IBS Acceptance. Demographic data collected from participants included age, marital status, educational level, ethnic origin, nationality and employment type. Consent was gained from all participants. The study was approved by the University of Edinburgh ethics board.

Measures

The Irritable Bowel Syndrome Symptom Severity Scale (IBS-SSS) (Francis, Morris, & Whorwell, 1997) measures five components of IBS symptoms as reported by the patient. Pain severity, pain frequency, distension, bowel satisfaction, and general impact on quality of life are rated from 0-100. Each subscale employs a visual analogue scale, with a total score out of 500. Patient scores are stratified according to case severity: mild (75-175), moderate (175-300) and severe (300+). Control cases with no IBS score below 75. The IBS-SSS shows acceptable reliability, and good concurrent validity with quality of life outcomes (Coffin, Dapoigny, Cloarec, Comet, & Dyard, 2004). In the current study internal consistency was α=.70.

The IBS36 (Groll et al., 2002) is a quality of life measure in IBS composed of 36-items. The measure comprehensively assesses aspects of life quality including sleep, food, social functioning, daily activity, sexual relations and emotional impact. Each item is scored by self-report on a Likert scale of frequency from 1 (*never*) - 7 (*always*). Scores are totalled out of 216 and higher scores indicate greater impact of IBS on quality of life. The IBS36 shows good internal consistency, construct validity, test-retest reliability and good responsiveness (Groll et al., 2002). In the current study internal consistency was α=.95.

The Visceral Sensitivity Index (VSI) (Labus et al., 2004) is a specific measure of GI-related anxiety in IBS. Made up of 15 items, each is scored on an agreement Likert scale from 1

(*Strongly Agree*) to 5 (*Strongly Disagree*). The scale assesses fear-related psychological and behavioural responses to visceral symptoms and the context in which they arise. Higher scores convey greater GI-related anxiety. The scale has good internal consistency, content and predictive validity (Labus et al., 2004; Labus et al., 2007). In the current study internal consistency was α=.92.

The Irritable Bowel Syndrome Behavioural Response Questionnaire (IBS-BRQ) (Reme, Darnley, Kennedy, & Chalder, 2010) measures stereotyped maladaptive IBS behaviours. It contains 26 items, each rated by self-report on a 1-7 Likert scale from 1 (*never*) to 7 (*always*). Assessed behaviours include: control of symptoms, specific food avoidance or seeking, avoidance of socialising, avoidance of normal activity including work and plan making, hypervigilance and repeated reassurance need. Higher scores reflect higher IBS-related behavioural patterns. In the current study internal consistency was α=.90.

The Irritable Bowel Syndrome Acceptance and Action Questionnaire (IBSAAQ) (Ferreira, Eugenicos, Morris, & Gillanders, 2013) is a 19-item scale of IBS specific acceptance. The IBS-AAQ is comprised of two factors: IBS Willingness and Activity Engagement. These cover acceptance of IBS symptoms and their severity, general quality of life, gastrointestinal anxiety, avoidance coping behaviours and psychological distress. Scores out of 120 indicate IBS acceptance levels with higher scores indicating greater acceptance. The IBS-AAQ has good interval consistency and test-retest reliability (Ferreira et al., 2013). In the current study internal consistency was α=.81.

Statistical Analysis

All analyses were completed using SPSS, version 25. Association of demographic variables with all measures were calculated to check for potentially confounding sources of spurious association. Ordinary least squared (OLS) regression-based path analysis was employed to test our hypotheses. Unstandardized regression coefficients were estimated as recommended in Hayes (2018), quantifying each step of the hypothesised model. For statistical inference, bootstrapped 95% confidence intervals were constructed for each estimate (Hayes, 2018). Bootstrapping samples were set to 10,000 and those which straddled zero were considered insignificant.

Moderated Serial Mediation We tested a model of moderated serial mediation, using the PROCESS v3 macro for SPSS, model 91 (Hayes, 2018). This model estimates i) the direct (symptom severity → quality of life) and ii) indirect (symptom severity → gastrointestinal anxiety → behavioural response → quality of life) pathways are also simultaneously tested and ii) the strength and direction of any interaction with the indirect pathway at different values of the moderator (mean, +1SD, -1SD). The latter is calculated as an index of moderated mediation.

Results

Sample description

The combined data set (*N*=166) had a mean age of 48.5 (13.2 ± *SD*) years and a 1 to 7.3 ratio of males (13.7%) to females (86.3%). This female-majority sample reflect the gender balance of the IBS patients attending specialized or tertiary gastroenterology services (Frissora & Koch, 2005). Average duration of IBS symptoms since diagnosis was 8.7 years (8.3 ± *SD*) and the most common Rome III classification was mixed sub-type (49.8%) with roughly equal constipated (17.8%) and diarrhoea (18.1%) sub-types. A small number of participants were ‘unsubtyped’. A proportion of the sample were unable to work as a result of their IBS

(7.2%). A majority of participants were white (77%) whilst 18% were Afro-Caribbean and 6% Asian. Full descriptive statistics for sociodemographic variables are presented in Appendix 1, Table 1.

Correlations

Zero-order correlations found a significant positive relationship between each hypothesised mediator (gastrointestinal anxiety, $r = .50$, $p < .01$ and behavioural response, $r = .52$, $p < .001$ and symptom severity). Strong positive correlations were also found between quality of life and gastrointestinal anxiety ($r = .68$, $p < .001$) and behavioural response ($r = .81$, $p < .001$). The latter could suggest multicollinearity. Scrutiny of the two measures found slight construct overlap in social functioning and eating behaviours. However, as this overlap is limited and only .001 above an acceptable threshold for multicollinearity effects (Field, 2013), the behavioural response variable was considered sufficiently independent to be included in the analysis. Furthermore, OLS regression-based path analysis methodologically 'partializes out' any mediator variance from other mediators preventing multicollinearity contamination between mediators (Hayes, 2018). Descriptive normality calculations of variable measure data are shown in Appendix 1, Table 2. Partial correlation, between gastrointestinal anxiety and behavioural response when controlling for symptom severity as a common cause was found ($r = .625$, $p < .001$). No statistically significant associations were found between any demographic variable and any of the variables in the hypothesised model (all $p < .05$); therefore, none needed to be included as covariates in the analysis and the degrees of freedom and subsequent power of the model was not hampered.

Path Analysis

A model of serial mediation (Table 1) confirmed the significance of the direct effect of symptom severity on quality of life (coefficient .1390, *95% CI* = .0970 - .1809, *t* =6.544, *p*<.001). The indirect regression path via gastrointestinal anxiety and behavioural response finds each step in the hypothesised mediation significant at the level of *p* <.001. The rationale for testing the full model of moderated serial mediation is strengthened by these results.

INSERT TABLE 1 AROUND HERE

Moderated Serial Mediation

A significant interaction was estimated between moderator IBS acceptance and the mediator chain (-.0091, *95% CI* = -.0163 to -.0019). A model summary of all regression coefficients is shown in Table 1. The strength of the indirect effect was at its greatest when IBS acceptance is weakest, and the higher the IBS acceptance score, the stronger the indirect effect. At one standard deviation above the mean IBS acceptance score (73.56) the weakest mediation occurred (.0485, *95%CI* = .0235 to .0782), at mean IBS acceptance (57.00) the mediation effect was larger (.0607, *95%CI* = .0342 to .0931) and at one standard deviation below mean IBS acceptance (36.88) the mediation effect is highest (.0756, *95%CI* = .0436 to .1175). The linear relation of the strength of the mediation pathway as a function of IBS acceptance is represented graphically in Figure 2. The slope gradient is calculated by the index of moderated mediation (-.0007, *95%CI* = -.0015 to -.0002).

INSERT FIGURE 2 AROUND HERE

Discussion

The present study aimed to investigate acceptance in IBS and the interaction between acceptance and other psychological factors previously established as mechanisms driving the IBS symptom experience. Our findings suggest we can retain our hypotheses and propose IBS acceptance as a determinant of the boundary conditions under which symptom severity impacts on quality of life in IBS.

The full model of moderated serial mediation found IBS acceptance to significantly interact at the level of the mediator chain from symptom severity to quality of life (via gastrointestinal anxiety and behavioural response). This indicates firstly, that the strength of the mediatory pathway appeared to be conditional on levels of IBS acceptance; and secondly, that the less IBS acceptance the stronger the mediation and the more IBS acceptance, the weaker the mediation effect. Our findings point toward a linear relation between IBS acceptance and the mediation of gastrointestinal anxiety and behavioural response in IBS experience. Therefore, the role of IBS acceptance in the mediatory path of experiences from symptom severity to quality of life could be an essential component when trying to understand or intervene in IBS.

The IBS acceptance literature is still in its infancy and therefore few studies have attempted to describe a model in which IBS acceptance as a variable is incorporated. There is a debate on whether acceptance acts as a moderator or mediator in chronic illness experiences. The literature seems to be divided on this issue. For example Hulme, Chilcot, & Smith (2018) found illness coherence and acceptance to mediate the impact between doctor-patient relationships and quality of life in IBS. However, psychological flexibility (which includes acceptance as a main factor) has also been proposed to moderate the relationship between somatization, illness anxiety and on quality of life in psychosomatic symptoms (Leonidou, Panayiotou, Bati, & Karekla, 2017).

We propose that acceptance could have both a mediator and a moderator role depending on the level of analysis. Within the ACT framework, as a continuous context-dependant range of processes, the construct of acceptance appears to conceptually fit the role of moderator over mediator if the analysis is set at a singular point in time. That is, as a relational variable, acceptance is focused on how one relates to his/her own experience, and theoretically it is not affected by the experience itself (therefore negating an essential condition for mediation; Hayes et al., 2006). One could only conceptualize acceptance as a mediator if the construct itself is being targeted for change (through an intervention, or longitudinally through life events that might shape learning around acceptance as a behaviour). Therefore, and being theoretically consistent, at a single point observation, one could only conceptualize acceptance as a learned relational responding style that can influence the person's experiential sense of the world, i.e. a moderator. This is further emphasized by the central claim of ACT that symptoms need not change for outcomes to improve, but it is actually the way people relate to their symptoms that needs to change (Hayes et al., 2006). On this basis, if acceptance acted as mediator with symptom severity as the first causal step, the latter would *have* to fluctuate in order to observe the changes in acceptance necessary for improvement – running against the definition of the construct. Furthermore, as an extension to this point, mathematically in OLS regression-based path analysis moderators behave differently to mediators. Mediators are causally related to one another, whilst moderators remain independent. Acceptance, unlike gastrointestinal anxiety and behavioural response, is - in our model - relatively independent of any of the psychosocial variables included in the model as it is not condition specific. Thus, the role of acceptance as a moderator of the afore mentioned mediator path seems to better fit our understanding of acceptance and its potential role in IBS. For example, it seem plausible that an individual experiencing severe symptoms of IBS would experience anxiety about his/her

condition; if the individual scores high on IBS acceptance, this will provide a buffer between physical/psychological/emotional experiences and behaviour response, allowing for a more adaptive behavioural reaction to the afore mentioned experiences; this would in turn open up the possibility for the individual to remain more connected with valued activities instead of activities geared towards the control/elimination of IBS experiences, hence experiencing a better quality of life. In other words, the more accepting the stance to the dynamics of the condition, the greater the separation between fearful and anxious cognitions and behaviours which deteriorate quality of life. By the same token an individual with low IBS acceptance would find unhelpful symptom-related cognitions direct behaviours towards avoidance of scenarios perceived to expose such oneself to mental and physical unwanted experiences. Focus is detracted from pursuing valued ends in favour of the haven on offer from avoidance. Quality of life is ultimately impaired by a sense of a life not lived to the fullest of its possibility. In this way, acceptance acts as a context-dependant, protective trait when high and a risk factor for poor outcomes when low.

On the other hand, several studies with populations similar to IBS (e.g. chronic pain which is a core symptom of IBS) have shown that changes in acceptance of illness following Acceptance and Commitment Therapy interventions mediate improvement in several physical and mental health outcomes (e.g. Vowles, Witkiewitz, Sowden, & Ashworth, 2014; Wicksell, Olsson, & Hayes, 2010). Therefore, given that acceptance is a highly trainable behavioural construct through Acceptance and Commitment Therapy, it stands to reason that the development and use of this intervention in IBS would prove of great clinical benefit. Two preliminary studies focusing on ACT for IBS (Ferreira, Gillanders, Morris, & Eugenicos, 2018; Gillanders et al., 2017) do seem to suggest that changes in IBS acceptance are at the core of improvements in the quality of life of IBS patients. In fact treatment related changes in IBS specific avoidance behaviours and Gastrointestinal anxiety in Ferreira,

Gillanders, Morris, & Eugenicos (2018) are both dependent on changes in IBS acceptance, which would fit with the proposed model of this paper. In Gillanders et al. (2017) only Gastrointestinal anxiety was shown to be affected by IBS acceptance, however this seemed to be constricted by the findings that only the IBS willingness component of acceptance was significantly changing. Given the findings on the present study and the two aforementioned studies, it is possible to tentatively infer that IBS acceptance is a key variable in promoting change in two of the most evidence based variables known to mediate the path between IBS symptoms and Quality of Life. Several dismantling studies point towards the importance of focusing on the exposure to symptoms (or symptom related contexts) as a way of reducing gastrointestinal anxiety over more cognitive techniques such as stress management (e.g. Craske et al., 2011; Ljótsson et al., 2011). In recent studies by Ljótsson and colleagues (e.g. Ljótsson et al. 2013; Hesser, Hedman-Lagerlöf, Andersson, Lindfors & Ljótsson, 2018) where a mindfulness and exposure (key targets of ACT interventions) enhanced CBT protocol was found to improve outcomes (symptoms and quality of life) through reductions in gastrointestinal anxiety and avoidance behaviours. These studies could be seen to be utilizing a proxy version of an ACT intervention. However, given the findings of this study one could infer that by targeting IBS acceptance, it is possible that ACT might enhance the potential for patients to expose themselves to IBS symptoms and reduce their gastrointestinal anxiety. This enhanced exposure could also be linked to a more acceptable re-framing that ACT provides for exposure; i.e. that is done in the service of valued directions that are intimately connected to a sense of quality of life.

Limitations

The use of single time-point, cross sectional data has implications for the kinds of conclusions we can draw from the results of the present study. Without longitudinal data,

operationalising our hypothesised mediators, inference on causal relations between serial mediators must be done with caution as the explanatory power of the model cannot be established. Control data from healthy participants would also be necessary to strengthen causal inference. It could be argued that finding moderating effects of psychological flexibility is the product of the cross-sectional study design: static nature of the data means a continuous variable lends itself better to being conceptualised as more 'trait-like' as there is no indication of any variation in differing contexts. However, returning to Hayes et al. (2006), psychological flexibility is conceptualised as dialogic with differing contextual environments. One could therefore hypothesize that the nature of acceptance is transactional rather than static, however, such assertions based on the findings of this study could only be classified as preliminary and tentative. Finally, unaccounted for variables could yet be responsible for epiphenomenal association, determining the observed relationships in our results.

Conclusion

To better understand the relation of multiple psychosocial variables has numerous advantages compared to studying them in isolation. Gaining a more comprehensive picture of these interacting factors will allow for better prediction of outcomes and more effective, individually-tailored treatments. The present study takes tentative steps toward reframing how we conceptualise psychological flexibility in IBS and adding weight to the rational for assessment and interventional targeting of this construct in clinical contexts.

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